

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Canceled)
2. (Currently Amended) The apparatus of claim 5 ~~[[1]]~~ wherein the red, green, blue and infrared intensity information are captured substantially contemporaneously.
3. (Currently Amended) The apparatus of claim 5 ~~[[1]]~~ further comprising:
a red pixel buffer coupled with the interpolation unit to store red intensity data;
a green pixel buffer coupled with the interpolation unit to store green intensity data;
a blue pixel buffer coupled with the interpolation unit to store blue intensity data;
and
an infrared pixel buffer coupled with the interpolation unit to store infrared intensity data.

4. (Original) The apparatus of claim 3 further comprising a signal processing unit coupled to the red pixel data buffer, the green pixel data buffer, the blue pixel data buffer and the infrared pixel data buffer.

5. (Currently Amended) An [[The]] apparatus of claim 1 comprising:
a sensor unit to capture wavelength intensity data for a plurality of pixel locations
wherein the sensor generates a value corresponding to an intensity of light from a
selected range of wavelengths for the pixel locations and further wherein infrared
intensity values are generated for a subset of the pixel locations wherein the sensor unit
captures intensity data according to a predetermined pattern comprising:

B	R	B	R
IR	G	IR	G
B	R	B	R
IR	G	IR	G

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information; and
an interpolation unit coupled with the sensor unit to interpolate intensity data to
estimate intensity values not generated by the sensor.

6. (Original) The apparatus of claim 5, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m

and n are both odd integers, the infrared intensity corresponding to the location (m,n) is

given by $IR = \frac{X(m-1,n) + X(m+1,n)}{2}$, the red intensity corresponding to the location

(m,n) is given by $R = \frac{X(m,n-1) + X(m,n+1)}{2}$, the green intensity corresponding to the

location (m,n) is given by

$G = \frac{X(m-1,n-1) + X(m-1,n+1) + X(m+1,n-1) + X(m+1,n+1)}{4}$, and the blue

intensity corresponding to the location (m,n) is given by $B = X(m,n)$.

7. (Original) The apparatus of claim 5, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m is an odd integer and n is an even integer, the infrared intensity corresponding to the location (m,n) is given by

$IR = \frac{X(m-1,n-1) + X(m+1,n-1) + X(m-1,n+1) + X(m+1,n+1)}{4}$, the red intensity

corresponding to the location (m,n) is given by $R = X(m,n)$, the green intensity

corresponding to the location (m,n) is given by $G = \frac{X(m-1,n) + X(m+1,n)}{2}$, and the

blue intensity corresponding to the location (m,n) is given by

$B = \frac{X(m,n-1) + X(m,n+1)}{2}$.

8. (Original) The apparatus of claim 5, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an even integer and n is an odd integer, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m, n)$, the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m-1, n-1) + X(m+1, n-1) + X(m-1, n+1) + X(m+1, n+1)}{4}$,

the green intensity corresponding to the location (m,n) is given by

$G = \frac{X(m, n-1) + X(m, n+1)}{2}$, and the blue intensity corresponding to the location (m,n)

is given by $B = \frac{X(m-1, n) + X(m+1, n)}{2}$.

9. (Original) The apparatus of claim 5, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m, n-1) + X(m, n+1)}{2}$, the red intensity corresponding to the location

(m,n) is given by $R = \frac{X(m-1, n) + X(m+1, n)}{2}$, the green intensity corresponding to the

location (m,n) is given by $G = X(m, n)$, and the blue intensity corresponding to the

location (m,n) is given by

$B = \frac{X(m-1, n-1) + X(m+1, n-1) + X(m-1, n+1) + X(m+1, n+1)}{4}$.

10. (Currently Amended) An [[The]] apparatus of claim 1 comprising:
a sensor unit to capture wavelength intensity data for a plurality of pixel locations
wherein the sensor generates a value corresponding to an intensity of light from a
selected range of wavelengths for the pixel locations and further wherein infrared
intensity values are generated for a subset of the pixel locations wherein the sensor unit
captures intensity data according to a predetermined pattern comprising:

IR	R	IR	B
G	IR	G	IR
IR	B	IR	R
G	IR	G	IR

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information; and
an interpolation unit coupled with the sensor unit to interpolate intensity data to
estimate intensity values not generated by the sensor.

11. (Original) The apparatus of claim 10, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m,n)$, and the green intensity corresponding to the location (m,n) is given by $G = \frac{X(m-1,n) + X(m+1,n)}{2}$, and further wherein if the pixel at location (m,n-

1) is red, the blue intensity corresponding to the location (m,n) is given by

$B = X(m, n + 1)$ and the red intensity corresponding to the location (m,n) is given by

$R = X(m, n - 1)$, and if the pixel at location (m,n-1) is blue, the red intensity

corresponding to the location (m,n) is given by $R = X(m, n + 1)$ and the blue intensity

corresponding to the location (m,n) is given by $B = X(m, n - 1)$.

12. (Original) The apparatus of claim 10, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n), if m is an odd integer and n is an even integer, the infrared intensity corresponding to the

location (m,n) is given by $IR = \frac{X(m-1,n) + X(m+1,n) + X(m,n-1) + X(m,n+1)}{4}$ and

green intensity corresponding to the location (m,n) is given by

$G = \frac{X(m-1,n-1) + X(m+1,n-1) + X(m-1,n+1) + X(m+1,n+1)}{4}$ and further wherein

if the pixel at location (m,n) is red, the blue intensity corresponding to the location (m,n)

is given by $B = \frac{X(m-2,n) + X(m+2,n) + X(m,n-2) + X(m,n+2)}{4}$ and the red

intensity corresponding to the location (m,n) is given by $R = X(m,n)$, and if the pixel at

location (m,n) is blue, the red intensity corresponding to the location (m,n) is given by

$B = X(m,n)$ and the blue intensity corresponding to the location (m,n) is given by

$R = \frac{X(m-2,n) + X(m+2,n) + X(m,n-2) + X(m,n+2)}{4}$.

13. (Original) The apparatus of claim 10, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an even integer and n is an odd integer, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m, n-1) + X(m, n+1) + X(m-1, n) + X(m+1, n)}{4}$ and green intensity corresponding to the location (m,n) is given by $G = X(m, n)$ and further wherein if the pixel at location (m-1,n-1) is red, the blue intensity corresponding to the location (m,n) is given by $B = \frac{X(m-1, n+1) + X(m+1, n-1)}{2}$ and the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m-1, n-1) + X(m+1, n+1)}{2}$, and if the pixel at location (m-1,n-1) is blue, the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m-1, n+1) + X(m+1, n-1)}{2}$ and the blue intensity corresponding to the location (m,n) is given by $B = \frac{X(m-1, n-1) + X(m+1, n+1)}{2}$.

14. (Original) The apparatus of claim 10, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both even integers, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m, n)$, and the green intensity corresponding to the location (m,n) is

given by $G = \frac{X(m, n-1) + X(m, n+1)}{2}$ and further wherein if the pixel at location (m-

1,n) is red, the blue intensity corresponding to the location (m,n) is given by

$B = X(m+1, n)$ and the red intensity corresponding to the location (m,n) is given by

$R = X(m-1, n)$, and if the pixel at location (m-1,n+1) is blue, the red intensity

corresponding to the location (m,n) is given by $R = X(m+1, n)$ and the blue intensity

corresponding to the location (m,n) is given by $B = X(m-1, n)$.

15. (Currently Amended) An [[The]] apparatus of claim 1 comprising:

a sensor unit to capture wavelength intensity data for a plurality of pixel locations wherein the sensor generates a value corresponding to an intensity of light from a selected range of wavelengths for the pixel locations and further wherein infrared intensity values are generated for a subset of the pixel locations wherein the sensor unit captures intensity data according to a predetermined pattern comprising:

B	R	B	R
G	IR	G	IR
B	R	B	R
G	IR	G	IR

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information; and

an interpolation unit coupled with the sensor unit to interpolate intensity data to estimate intensity values not generated by the sensor.

16. (Original) The apparatus of claim 15, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m-1, n-1) + X(m-1, n+1) + X(m+1, n+1) + X(m+1, n-1)}{4}$, the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m, n-1) + X(m, n+1)}{2}$, the green intensity corresponding to the location (m,n) is given by $G = \frac{X(m-1, n) + X(m+1, n)}{2}$, and the blue intensity corresponding to the location (m,n) is given by $B = X(m, n)$.

17. (Original) The apparatus of claim 15, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an odd integer and n is an even integer, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m-1, n) + X(m+1, n)}{2}$, the red intensity corresponding to the location (m,n) is given by $R = X(m, n)$, the green intensity corresponding to the location (m,n) is given by

$$G = \frac{X(m-1, n-1) + X(m+1, n-1) + X(m-1, n+1) + X(m+1, n+1)}{4}, \text{ and the blue}$$

$$\text{intensity corresponding to the location (m,n) is given by } B = \frac{X(m, n-1) + X(m, n+1)}{2}.$$

18. (Original) The apparatus of claim 15, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an even integer and n is an odd integer, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m, n-1) + X(m, n+1)}{2}$, the red intensity corresponding

to the location (m,n) is given by

$$R = \frac{X(m-1, n-1) + X(m+1, n-1) + X(m+1, n+1) + X(m-1, n+1)}{4}, \text{ the green intensity}$$

corresponding to the location (m,n) is given by $G = X(m, n)$, and the blue intensity

$$\text{corresponding to the location (m,n) is given by } B = \frac{X(m-1, n) + X(m+1, n)}{2}.$$

19. (Original) The apparatus of claim 15, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m, n)$, the red intensity corresponding to the location (m,n) is given by

$$R = \frac{X(m-1, n) + X(m+1, n)}{2}, \text{ the green intensity corresponding to the location (m,n) is}$$

given by $G = \frac{X(m, n+1) + X(m, n-1)}{2}$, and the blue intensity corresponding to the

location (m,n) is given by

$$B = \frac{X(m-1, n-1) + X(m+1, n+1) + X(m-1, n+1) + X(m+1, n-1)}{4}.$$

20. (Currently Amended) An [[The]] apparatus of claim 1 comprising:
a sensor unit to capture wavelength intensity data for a plurality of pixel locations
wherein the sensor generates a value corresponding to an intensity of light from a
selected range of wavelengths for the pixel locations and further wherein infrared
intensity values are generated for a subset of the pixel locations wherein the sensor unit
captures intensity data according to a predetermined pattern comprising:

B	G	B	<u>G[[B]]</u>
IR	R	IR	R
B	G	B	G
IR	R	IR	R

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information; and
an interpolation unit coupled with the sensor unit to interpolate intensity data to
estimate intensity values not generated by the sensor.

21. (Original) The apparatus of claim 20, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a

column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m-1,n) + X(m+1,n)}{2}$, the red intensity corresponding to the location

(m,n) is given by $R = \frac{X(m-1,n-1) + X(m-1,n+1) + X(m+1,n+1) + X(m+1,n-1)}{4}$,

the green intensity corresponding to the location (m,n) is given by

$G = \frac{X(m,n-1) + X(m,n+1)}{2}$, and the blue intensity corresponding to the location (m,n)

is given by $B = X(m,n)$.

22. (Original) The apparatus of claim 20, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m is an odd integer and n is an even integer, the infrared intensity corresponding to the location (m,n) is given by

$IR = \frac{X(m-1,n-1) + X(m+1,n-1) + X(m-1,n+1) + X(m+1,n+1)}{4}$, the red intensity

corresponding to the location (m,n) is given by $R = \frac{X(m-1,n) + X(m+1,n)}{2}$, the green

intensity corresponding to the location (m,n) is given by $G = X(m,n)$, and the blue

intensity corresponding to the location (m,n) is given by $B = \frac{X(m,n-1) + X(m,n+1)}{2}$.

23. (Original) The apparatus of claim 20, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an even integer and n is an odd integer, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m, n)$, the red intensity corresponding to the location (m,n) is given by $R = X(m-1, n)$, the green intensity corresponding to the location (m,n) is given by $G = \frac{X(m-1, n-1) + X(m+1, n-1) + X(m-1, n+1) + X(m+1, n+1)}{4}$, and the blue intensity corresponding to the location (m,n) is given by

$$B = \frac{X(m-1, n) + X(m+1, n)}{2}.$$

24. (Original) The apparatus of claim 20, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m, n-1) + X(m, n+1)}{2}$, the red intensity corresponding to the location (m,n) is given by $R = X(m, n)$, the green intensity corresponding to the location (m,n) is given by $G = \frac{X(m-1, n) + X(m+1, n)}{2}$, and the blue intensity corresponding to the location (m,n) is given by

$$B = \frac{X(m-1, n-1) + X(m+1, n+1) + X(m+1, n-1) + X(m-1, n+1)}{4}.$$

25. (Canceled)

26. (Currently Amended) An ~~[[The]]~~ apparatus ~~of claim 25~~ comprising:
a complementary metal-oxide semiconductor (CMOS) sensor to capture an array
of pixel data; and
a color filter array (CFA) to pass selected wavelength ranges to respective pixel
locations of the CMOS sensor according to a predetermined pattern, wherein the
wavelength ranges include at least infrared wavelengths for one or more pixel locations
wherein the predetermined pattern comprises:

B	R	B	R
IR	G	IR	G
B	R	B	R
IR	G	IR	G

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information.

27. (Original) The apparatus of claim 26, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is

given by $IR = \frac{X(m-1,n) + X(m+1,n)}{2}$, the red intensity corresponding to the location

(m,n) is given by $R = \frac{X(m,n-1) + X(m,n+1)}{2}$, the green intensity corresponding to the

location (m,n) is given by

$G = \frac{X(m-1,n-1) + X(m-1,n+1) + X(m+1,n-1) + X(m+1,n+1)}{4}$, and the blue

intensity corresponding to the location (m,n) is given by $B = X(m,n)$.

28. (Original) The apparatus of claim 26, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an odd integer and n is an even integer, the infrared intensity corresponding to the location (m,n) is given by

$IR = \frac{X(m-1,n-1) + X(m+1,n-1) + X(m-1,n+1) + X(m+1,n+1)}{4}$, the red intensity

corresponding to the location (m,n) is given by $R = X(m,n)$, the green intensity

corresponding to the location (m,n) is given by $G = \frac{X(m-1,n) + X(m+1,n)}{2}$, and the

blue intensity corresponding to the location (m,n) is given by

$B = \frac{X(m,n-1) + X(m,n+1)}{2}$.

29. (Original) The apparatus of claim 26, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a

column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m is an even integer and n is an odd integer, the infrared intensity corresponding to the location (m,n) is given by $IR = (m,n)$, the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m-1,n-1) + X(m+1,n-1) + X(m-1,n+1) + X(m+1,n+1)}{4}$,

the green intensity corresponding to the location (m,n) is given by

$G = \frac{X(m,n-1) + X(m,n+1)}{2}$, and the blue intensity corresponding to the location (m,n)

is given by $B = \frac{X(m-1,n) + X(m+1,n)}{2}$.

30. (Original) The apparatus of claim 26, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m,n-1) + X(m,n+1)}{2}$, the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m-1,n) + X(m+1,n)}{2}$, the green intensity corresponding to the location (m,n) is given by $G = X(m,n)$, and the blue intensity corresponding to the location (m,n) is given by

$B = \frac{X(m-1,n-1) + X(m+1,n-1) + X(m-1,n+1) + X(m+1,n+1)}{4}$.

31. (Currently Amended) An ~~of claim 25~~ [[The]] apparatus comprising:

a complementary metal-oxide semiconductor (CMOS) sensor to capture an array of pixel data; and

a color filter array (CFA) to pass selected wavelength ranges to respective pixel locations of the CMOS sensor according to a predetermined pattern, wherein the wavelength ranges include at least infrared wavelengths for one or more pixel locations wherein the predetermined pattern comprises:

IR	R	IR	B
G	IR	G	IR
IR	B	IR	R
G	IR	G	IR

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information.

32. (Original) The apparatus of claim 31, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m,n)$, and the green intensity corresponding to the location (m,n) is given by $G = \frac{X(m-1,n) + X(m+1,n)}{2}$, and further wherein if the pixel at location (m,n-1) is red, the blue intensity corresponding to the location (m,n) is given by $B = X(m,n+1)$ and the red intensity corresponding to the location (m,n) is given by

$R = X(m, n - 1)$, and if the pixel at location $(m, n - 1)$ is blue, the red intensity corresponding to the location (m, n) is given by $R = X(m, n + 1)$ and the blue intensity corresponding to the location (m, n) is given by $B = X(m, n - 1)$.

33. (Original) The apparatus of claim 31, wherein for a pixel in the predetermined pixel pattern in a location (m, n) where m indicates a row and n indicates a column and $X(m, n)$ is the intensity corresponding to the pixel in the location (m, n) , if m is an odd integer and n is an even integer, the infrared intensity corresponding to the location (m, n) is given by $IR = \frac{X(m - 1, n) + X(m + 1, n) + X(m, n - 1) + X(m, n + 1)}{4}$ and

green intensity corresponding to the location (m, n) is given by

$G = \frac{X(m - 1, n - 1) + X(m + 1, n - 1) + X(m - 1, n + 1) + X(m + 1, n + 1)}{4}$ and further wherein

if the pixel at location (m, n) is red, the blue intensity corresponding to the location (m, n) is given by $B = \frac{X(m - 2, n) + X(m + 2, n) + X(m, n - 2) + X(m, n + 2)}{4}$ and the red

intensity corresponding to the location (m, n) is given by $R = X(m, n)$, and if the pixel at location (m, n) is blue, the red intensity corresponding to the location (m, n) is given by $B = X(m, n)$ and the blue intensity corresponding to the location (m, n) is given by

$R = \frac{X(m - 2, n) + X(m + 2, n) + X(m, n - 2) + X(m, n + 2)}{4}$.

34. (Original) The apparatus of claim 31, wherein for a pixel in the predetermined pixel pattern in a location (m, n) where m indicates a row and n indicates a

column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m is an even integer and n is an odd integer, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m,n-1) + X(m,n+1) + X(m-1,n) + X(m+1,n)}{4}$ and green intensity corresponding to the location (m,n) is given by $G = X(m,n)$ and further wherein if the pixel at location $(m-1,n-1)$ is red, the blue intensity corresponding to the location (m,n) is given by $B = \frac{X(m-1,n+1) + X(m+1,n-1)}{2}$ and the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m-1,n-1) + X(m+1,n+1)}{2}$, and if the pixel at location $(m-1,n-1)$ is blue, the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m-1,n+1) + X(m+1,n-1)}{2}$ and the blue intensity corresponding to the location (m,n) is given by $B = \frac{X(m-1,n-1) + X(m+1,n+1)}{2}$.

35. (Original) The apparatus of claim 31, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m and n are both even integers, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m,n)$, and the green intensity corresponding to the location (m,n) is given by $G = \frac{X(m,n-1) + X(m,n+1)}{2}$ and further wherein if the pixel at location $(m-1,n)$ is red, the blue intensity corresponding to the location (m,n) is given by $B = X(m+1,n)$ and the red intensity corresponding to the location (m,n) is given by

$R = X(m-1, n)$, and if the pixel at location $(m-1, n+1)$ is blue, the red intensity corresponding to the location (m, n) is given by $R = X(m+1, n)$ and the blue intensity corresponding to the location (m, n) is given by $B = X(m-1, n)$.

36. (Currently Amended) An [[The]] apparatus of claim 25 comprising:
a complementary metal-oxide semiconductor (CMOS) sensor to capture an array
of pixel data; and
a color filter array (CFA) to pass selected wavelength ranges to respective pixel
locations of the CMOS sensor according to a predetermined pattern, wherein the
wavelength ranges include at least infrared wavelengths for one or more pixel locations
the predetermined pattern comprises:

B	R	B	R
G	IR	G	IR
B	R	B	R
G	IR	G	IR

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information.

37. (Original) The apparatus of claim 36, wherein for a pixel in the predetermined pixel pattern in a location (m, n) where m indicates a row and n indicates a column and $X(m, n)$ is the intensity corresponding to the pixel in the location (m, n) , if m

and n are both odd integers, the infrared intensity corresponding to the location (m,n) is

given by $IR = \frac{X(m-1, n-1) + X(m-1, n+1) + X(m+1, n+1) + X(m+1, n-1)}{4}$, the red

intensity corresponding to the location (m,n) is given by $R = \frac{X(m, n-1) + X(m, n+1)}{2}$,

the green intensity corresponding to the location (m,n) is given by

$G = \frac{X(m-1, n) + X(m+1, n)}{2}$, and the blue intensity corresponding to the location (m,n)

is given by $B = X(m, n)$.

38. (Original) The apparatus of claim 36, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an odd integer and n is an even integer, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m-1, n) + X(m+1, n)}{2}$, the red intensity corresponding to the location (m,n) is given by $R = X(m, n)$, the green intensity corresponding to the location (m,n) is given by

$G = \frac{X(m-1, n-1) + X(m+1, n-1) + X(m-1, n+1) + X(m+1, n+1)}{4}$, and the blue

intensity corresponding to the location (m,n) is given by $B = \frac{X(m, n-1) + X(m, n+1)}{2}$.

39. (Original) The apparatus of claim 36, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a

column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m is an even integer and n is an odd integer, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m,n-1) + X(m,n+1)}{2}$, the red intensity corresponding

to the location (m,n) is given by

$$R = \frac{X(m-1,n-1) + X(m+1,n-1) + X(m+1,n+1) + X(m-1,n+1)}{4}, \text{ the green intensity}$$

corresponding to the location (m,n) is given by $G = X(m,n)$, and the blue intensity

$$\text{corresponding to the location } (m,n) \text{ is given by } B = \frac{X(m-1,n) + X(m+1,n)}{2}.$$

40. (Original) The apparatus of claim 36, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and $X(m,n)$ is the intensity corresponding to the pixel in the location (m,n) , if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m,n)$, the red intensity corresponding to the location (m,n) is given by

$$R = \frac{X(m-1,n) + X(m+1,n)}{2}, \text{ the green intensity corresponding to the location } (m,n) \text{ is}$$

$$\text{given by } G = \frac{X(m,n+1) + X(m,n-1)}{2}, \text{ and the blue intensity corresponding to the}$$

location (m,n) is given by

$$B = \frac{X(m-1,n-1) + X(m+1,n+1) + X(m-1,n+1) + X(m+1,n-1)}{4}.$$

41. (Currently Amended) An ~~[[The]]~~ apparatus of claim 25 comprising:

a complementary metal-oxide semiconductor (CMOS) sensor to capture an array of pixel data; and

a color filter array (CFA) to pass selected wavelength ranges to respective pixel locations of the CMOS sensor according to a predetermined pattern, wherein the wavelength ranges include at least infrared wavelengths for one or more pixel locations wherein the predetermined pattern comprises:

B	G	B	<u>G</u> [[B]]
IR	R	IR	R
B	G	B	G
IR	R	IR	R

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information.

42. (Original) The apparatus of claim 41, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m-1,n) + X(m+1,n)}{2}$, the red intensity corresponding to the location (m,n) is given by $R = \frac{X(m-1,n-1) + X(m-1,n+1) + X(m+1,n+1) + X(m+1,n-1)}{4}$, the green intensity corresponding to the location (m,n) is given by

$G = \frac{X(m, n-1) + X(m, n+1)}{2}$, and the blue intensity corresponding to the location (m,n)

is given by $B = X(m, n)$.

43. (Original) The apparatus of claim 41, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an odd integer and n is an even integer, the infrared intensity corresponding to the location (m,n) is given by

$IR = \frac{X(m-1, n-1) + X(m+1, n-1) + X(m-1, n+1) + X(m+1, n+1)}{4}$, the red intensity

corresponding to the location (m,n) is given by $R = \frac{X(m-1, n) + X(m+1, n)}{2}$, the green

intensity corresponding to the location (m,n) is given by $G = X(m, n)$, and the blue

intensity corresponding to the location (m,n) is given by $B = \frac{X(m, n-1) + X(m, n+1)}{2}$.

44. (Original) The apparatus of claim 41, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m is an even integer and n is an odd integer, the infrared intensity corresponding to the location (m,n) is given by $IR = X(m, n)$, the red intensity corresponding to the location (m,n) is given by $R = X(m-1, n)$, the green intensity corresponding to the location (m,n)

is given by $G = \frac{X(m-1, n-1) + X(m+1, n-1) + X(m-1, n+1) + X(m+1, n+1)}{4}$, and the

blue intensity corresponding to the location (m,n) is given by

$$B = \frac{X(m-1, n) + X(m+1, n)}{2}.$$

45. (Original) The apparatus of claim 41, wherein for a pixel in the predetermined pixel pattern in a location (m,n) where m indicates a row and n indicates a column and X(m,n) is the intensity corresponding to the pixel in the location (m,n), if m and n are both odd integers, the infrared intensity corresponding to the location (m,n) is given by $IR = \frac{X(m, n-1) + X(m, n+1)}{2}$, the red intensity corresponding to the location

(m,n) is given by $R = X(m, n)$, the green intensity corresponding to the location (m,n) is given by $G = \frac{X(m-1, n) + X(m+1, n)}{2}$, and the blue intensity corresponding to the

location (m,n) is given by

$$B = \frac{X(m-1, n-1) + X(m+1, n+1) + X(m+1, n-1) + X(m-1, n+1)}{4}.$$

46-70. (Canceled)

71. (Currently Amended) The sensor of claim 72 ~~[[70]]~~ wherein red intensity values, green intensity values, blue intensity values and infrared intensity values are capture substantially contemporaneously.

72. (Currently Amended) A sensor that receives pixel data representing color intensity values for a plurality of pixel locations of a scene to be captured according to a predetermined pattern, wherein one or more of the color intensity values corresponds to intensity of light having infrared wavelengths ~~The apparatus of claim 70~~ wherein the predetermined pattern comprises:

B	R	B	R
IR	G	IR	G
B	R	B	R
IR	G	IR	G

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information.

73. (Currently Amended) A sensor that receives pixel data representing color intensity values for a plurality of pixel locations of a scene to be captured according to a predetermined pattern, wherein one or more of the color intensity values corresponds to intensity of light having infrared wavelengths wherein the predetermined pattern comprises:

IR	R	IR	B
G	IR	G	IR
IR	B	IR	R

G	IR	G	IR
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where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information.

74. (Currently Amended) A sensor that receives pixel data representing color intensity values for a plurality of pixel locations of a scene to be captured according to a predetermined pattern, wherein one or more of the color intensity values corresponds to intensity of light having infrared wavelengths wherein the predetermined pattern comprises:

B	R	B	R
G	IR	G	IR
B	R	B	R
G	IR	G	IR

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information.

75. (Currently Amended) A sensor that receives pixel data representing color intensity values for a plurality of pixel locations of a scene to be captured according to a predetermined pattern, wherein one or more of the color intensity values corresponds to intensity of light having infrared wavelengths wherein the predetermined pattern comprises:

B	G	B	<u>G</u> [[B]]
IR	R	IR	R
B	G	B	G
IR	R	IR	R

where R indicates red intensity information, G indicates green intensity information, B indicates blue intensity information and IR indicates infrared intensity information.

76-104. (Canceled)